

CENTRAL COLORADO PROJECT (CCP)

Western Renewable Energy & Water Productivity Multiplier

WHITE PAPER

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April 19, 2007

EXECUTIVE SUMMARY

Our Nation's growing Western Region has an escalating renewable energy and water shortage crisis. This paper, for the first time, fully reveals how the innovative Central Colorado Project (CCP) can soon solve a significant portion of this seemingly intractable crisis. CCP's unique concept employs a single high altitude regulating reservoir to multiply the productivity of renewable energy and water resources and systems throughout the Southwestern Region's major river basins on both sides of the Continental Divide. CCP's regional high storage concept for enhanced energy and water productivity has significant worldwide potential for human and environmental needs.

HISTORICAL PERSPECTIVES

Naturalists understand that high-altitude beaver dams have protected and enhanced Western river valleys and environments for thousands of years. Hydrologists also recognize that headwater reservoirs have multiple use and reuse advantages for entire river systems over comparable down river storage facilities. Unfortunately, the latent economic and environmental advantages of headwater reservoirs have never been recognized and applied in Western water development doctrine or practice.

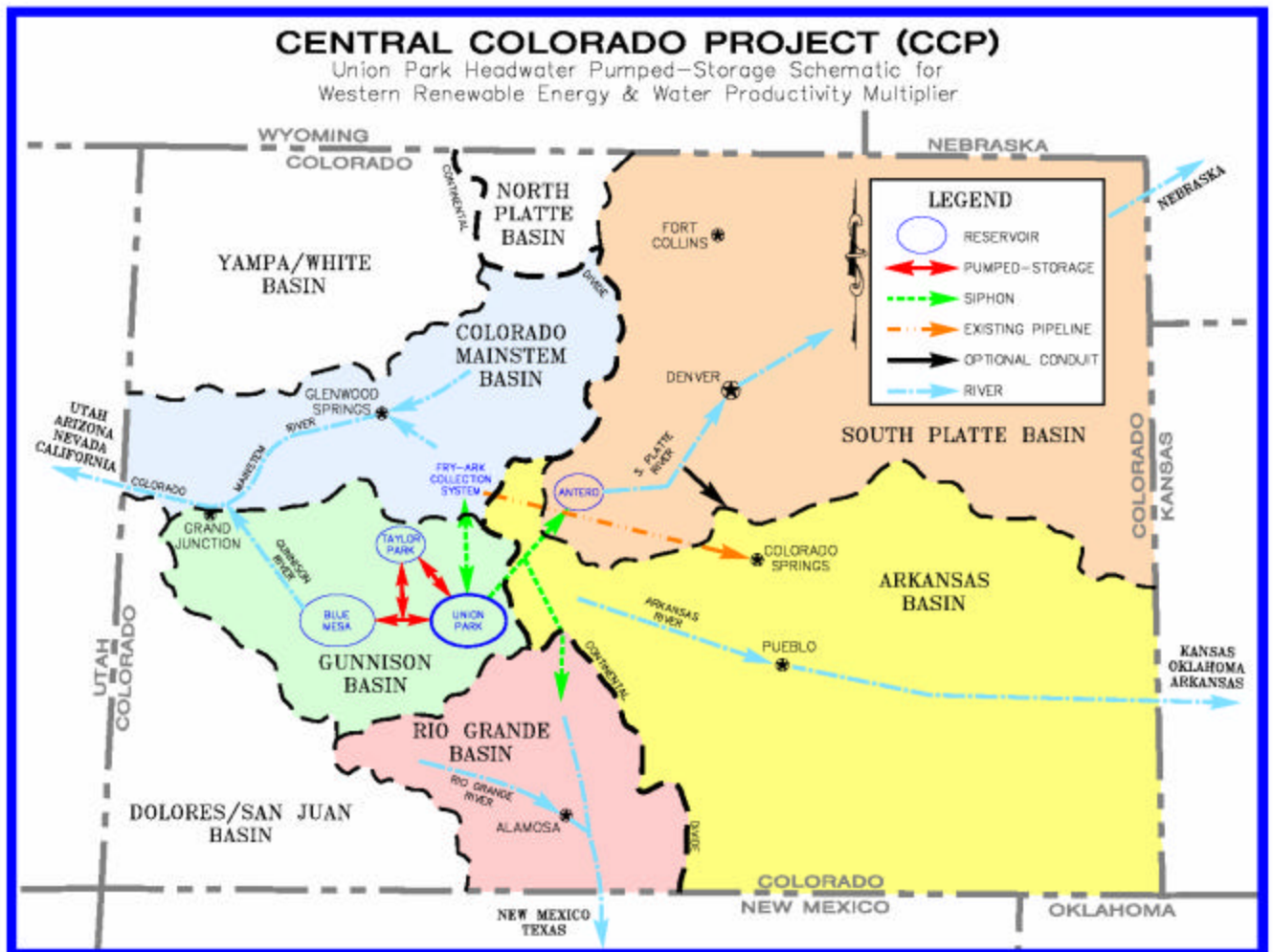
Institutional barriers and technical constraints have worked against regional water resources planning with high-altitude pumped-storage. As a result, most Western dams are located down-river in low and medium-altitude sites. These traditional dams on rivers, have limited socio-economic benefits, cause serious environmental impacts, and suffer excessive evaporation losses. They are also largely responsible for our Nation's thirty-year "green movement" against new water storage projects. Central Colorado Project's high-

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altitude, off-river, pumped-storage concept is an environmental and economic breakthrough for the Western Region's vital renewable energy and water supply industries.

KEY FEATURES

Union Park Reservoir, to be located off-river near the Continental Divide in Gunnison National Forest, is a key feature of CCP's advanced Western energy and water conservation concept. Recent "Feasibility Level Geological and Geotechnical Investigations, and Preliminary Design Studies for Union Park Dam" [1, 2] confirmed that this 575-foot-high structure can safely store up to 1.2 million acre-feet of water (Colorado's largest reservoir) for the region's highest priority energy and water needs. Construction of Union Park's modern roller compacted concrete (RCC) dam can be completed in approximately 18 months. The dam's estimated construction cost is 395 million dollars, which is only 330 dollars per acre-foot of multi-purpose storage.



Union Park Reservoir will employ a 42-mile inverted gravity siphon to augment the South Platte and Arkansas River Basins, when necessary, for high priority human and environmental needs. A Poncha Pass Branch of this siphon will augment the Rio Grande Basin, when needed, for similar priority purposes. A reversible lateral siphon will

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interconnect Union Park Reservoir with the Bureau of Reclamation's existing Fryingpan-Arkansas Upper Colorado River Collection System, for enhanced flood and drought protection throughout east and west sides of the Continental Divide. An optional South Platte-Palmer Divide gravity conduit can efficiently serve central Front Range and Colorado Springs needs.

ENERGY MULTIPLIER VALUES

CCP's large off-channel Union Park reservoir, located at 10,120 feet altitude, will be filled via high-capacity reversible pump generators from the Bureau's existing Blue Mesa and Taylor Park Reservoirs, located at 7,393 and 9,319 feet. This filling operation will occur during heavy spring snowmelt months, when surplus energy and flood waters are abundantly available for high-altitude pumped-storage. Union Park's large energy storage capability converts surplus, and currently wasted, base power from coal, nuclear, hydro, solar, and wind generation facilities into instantly available peaking power for the Western Power Grid. Back-up peaking power is essential to prevent regional brown and blackouts during high demand summer cooling and winter heating months. Reliable peaking power can have system-wide values up to ten times regular base power values.

Managed water releases and dependable river flows from Union Park's flexible high-altitude storage site can also substantially increase hydro-power yields from existing down-river dams throughout the Gunnison, Colorado, Platte, Arkansas, and Rio Grande River Basins. Some of the smaller down-river dams, that are not equipped with hydro-power, can be economically upgraded to provide clean renewable energy, after CCP's optimized multi-river regulating capabilities are implemented. Revenues from CCP's unique regional energy multiplier capabilities will cover a large portion of the project's construction and operating costs for regional water multiplier capabilities.

WATER MULTIPLIER VALUES

CCP's single high-altitude Union Park Reservoir and advanced pumped-storage operation can regulate and multiply water resource benefits throughout the Southwestern Region's five largest river basins. Specifically, CCP's flexible river augmentation capabilities can assure the following real time benefits for Colorado and its eleven down river states (Utah, Arizona, Nevada, California, New Mexico, Texas, Kansas, Oklahoma, Arkansas, Nebraska, and Wyoming):

- Managed gravity augmentations from CCP's strategic high-altitude storage site will automatically integrate and substantially increase the reliability, productivity, and quality of existing developed water rights and storage systems throughout the Gunnison, Colorado, Platte, Arkansas, and Rio Grande River Basins;
- Captured snowmelt and timely releases from Union Park's high storage can balance, protect, and optimize regional river flows, reservoir levels, and water quality under unpredictable and highly variable flood and drought conditions;

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- CCP's newly developed Colorado River Compact entitlements can conserve and optimize use of damaging spring flood flows for Upper Gunnison Basin-of-origin needs. These local needs include flood control, and optimized river flows for droughts, growth, irrigation, and recreation;
- CCP will provide managed optimal flows for Black Canyon of the Gunnison National Park and the Colorado River Endangered Fish Recovery Program. Lake Union Park can also become a world destination Lake Trout fishery;
- Water productivity multipliers from CCP can reverse regional water shortages from urban growth, which are escalating loss of irrigated Western farms and green valleys;
- CCP's integrated regional capabilities obviate current local proposals to develop non-integrated Colorado conditional use and reuse water rights, that would excessively deplete West and East Slope rivers to less than 50% of historic native flows;
- During long wet cycles, CCP's pumped-storage infrastructure can be used to recharge declining Western ground water reserves, including the vital Ogallala, Denver, and San Luis aquifers;
- CCP's high-altitude pumped-storage concept can reduce regional evaporation losses. For example, projected annual evaporation from the largely frozen 7.8 square mile surface of Lake Union Park is about 1½ feet vs. up to 7 feet from hot desert storage sites. The West is losing a large portion of its finite renewable water supplies to evaporation from low-altitude reservoirs;
- CCP's high storage and responsive water regulation capabilities can be used by Colorado and down river states to assure equitable development and maximum productivity from their respective interstate compact entitlements. Snowmelt and rain from Colorado's high mountain terrain generates a large portion of all renewable waters that flow in the Southwestern Region's five major river systems. All down-river states can gain from CCP's flexible headwater storage in Colorado;
- Water conservation, productivity, and regulating advancements from CCP can offset potential adverse impacts from global warming, while reducing long-term renewable energy and water costs for Western consumers.

FLOOD AND PUBLIC SAFETY BENEFITS

Recent Department of Interior and Bureau of Reclamation dam safety studies [3, 4, 5] predict Taylor Park, Blue Mesa, and Pueblo Dams could suddenly fail with floods above 55% of the projected Probable Maximum Flood (PMF). In addition to the high hydrologic or flood failure risk (inadequate spillway capacity and possible overtopping of the structure), Taylor Park Dam may also fail during a moderate seismic event that could liquefy materials in the embankment or foundation. Considering the hazards at all three dam locations, an estimated 16,000 lives are currently at risk. The above referenced "Feasibility Level Geological and Geotechnical Investigations, and Preliminary Design Studies for Union

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Park Dam” confirmed Union Park Dam will not require an emergency spillway for floods, because of the reservoir’s small 26-square mile-upstream drainage area and the dam’s large freeboard capacity. Furthermore, the seismic stability of Union Park Dam is considerably increased because the dam is designed as a massive concrete gravity structure resting on a foundation of competent granitic rock. These studies also indicate Union Park’s high-volume pumping capabilities and large storage capacity can be operated to greatly reduce catastrophic Flood-Failure risks from these major Bureau reservoirs. CCP’s flood protection and public safety values for vulnerable down stream federal dams are unique in the water development industry.

CONGRESSIONAL MANDATE

Congress authorized construction of the Bureau’s Aspinall Reservoirs (Blue Mesa, Morrow Point, and Crystal) in 1956 to primarily help Colorado develop about a third of its remaining unused Colorado River Compact entitlements for local and statewide consumptive needs. Colorado subsequently granted the Bureau its 300,000 acre-feet Aspinall Marketable Pool Water Right for that specific purpose. Revenues from long-term Aspinall Pool water service contracts were intended as user repayments for Congress’s original Aspinall Project construction authorization. A recent Colorado Supreme Court ruling confirmed the Bureau’s unused Aspinall Pool Rights are still available for contracting and upstream development for local and statewide consumptive needs.

All Upper Colorado River trans-mountain diversions are from Colorado’s Main-Stem Basin tributaries. Colorado’s wetter untapped Gunnison Basin Branch of the Colorado River still has most of its original average annual native outflows at Grand Junction. The Gunnison River and the Bureau’s available Aspinall storage and Aspinall Pool Rights provide a large dependable water source for new high-altitude storage. CCP will finally fulfill Congress’s 1956 regional water development and repayment mandates for Colorado and the Bureau of Reclamation. CCP’s energy and water productivity multipliers for our Nation’s Western and Southwestern Regions are an unprecedented added bonus.

OWNERSHIP AND CONTROL

Participating energy and water providers can cooperatively own, finance, and operate CCP with a Central Colorado Project Authority (CCPA), for mutual benefits of local and regional stakeholders. Farm and environmental associations, as well as down river states, may be represented on CCPA’s Board and operational management team. CCP’s complex energy/water storage and distribution decisions can be optimized with computers and real time flood, normal, and drought flow data from ground and satellite reporting stations.

EXPECTED BENEFIT- COST RATIO

A farsighted team of energy, water, and environmental planning experts can employ advanced computer simulation techniques to quickly confirm CCP’s preliminary expected benefit-cost ratio of at least 10 to 1. Most traditional Western storage projects on rivers were built with 2 to 1 benefit-cost expectations. The National Environmental Policy Act

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(NEPA) requires objective economic and environmental comparisons of all reasonable alternatives. Preliminary quantification of CCP's unique regional energy and water multiplier values will greatly simplify NEPA scoping comparisons with those other non-integrated local alternatives, currently being considered.

CONCLUSION

CCP's innovative high-altitude pumped-storage concept can substantially increase the productivity and quality of finite renewable Western energy and water resources throughout the new millennium. Western consumers and environments will realize unprecedented benefits from CCP. Historically competing stakeholders now have strong economic and environmental incentives, to unite behind emergency development of Central Colorado Project for current and future generations. Union Park is the world's only headwater conservation site that can provide epic enhancements for natural and human needs throughout five arid and semi-arid river basins.

References to Professional Papers and Reports:

- [1] Feasibility Level Geological and Geotechnical Investigation for Union Park Dam by Horst Ueblacker, P.E., *UEBLACKER ASSOCIATES* (www.ueblacker.us): Proceedings 41st U.S. Symposium on Rock Mechanics, Paper ARMA/USRMS 06-960, June 17-21, 2006, Golden, Colorado, 28 pages, 30 references;
- [2] Feasibility Study and Preliminary Design of Union Park Dam by Horst Ueblacker, P.E., *UEBLACKER ASSOCIATES* (www.ueblacker.us): Proceedings 26th United States Society on Dams (USSD) Annual Meeting and Conference, May 1-5, 2006, San Antonio, Texas, 32 pages, 29 references;
- [3] Safety Evaluation of Existing Dams Analysis Summary (SEED Analysis Summary) TAYLOR PARK DAM. Prepared by Becky Morfitt, Lead Branch Coordinator, U.S. Department of the Interior Bureau of Reclamation, Denver, Colorado, November 27, 1989, (Library Document TC 557.C6 T39s 1999);
- [4] Report of Findings of the Issue Evaluation, TAYLOR PARK DAM Uncompahgre Project. U.S. Department of the Interior Bureau of Reclamation Technical Service Center, Denver, Colorado: Technical Memorandum No. TL-8312-4, March 2002 (Library Document TC 557.C6 T39 M35 2002);
- [5] PUEBLO DAM – RISK ANALYSIS Modified Dam Including Contraction Joint Leakage and Concrete Dam Tension Issues. Prepared by Mark Steers and John Trojanowski, U.S. Department of the Interior Bureau of Reclamation Technical Service Center, Denver, Colorado, July 2000.